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Building Global Health Through a Center-Without-Walls: The Vanderbilt Institute for Global Health

Sten H. Vermund, MD, PhD,

Amos Christie Chair in Global Health, director, Institute for Global Health, and professor, Pediatrics, Vanderbilt University School of Medicine, Nashville, Tennessee

Vikrant V. Sahasrabudhe, MBBS, DrPH,

Assistant professor, Pediatrics, and director, Vanderbilt–India Cervical Cancer Program, Vanderbilt University School of Medicine, Nashville, Tennessee

Sheetal Khedkar, MBBS, MSPH,

Senior research assistant, Institute for Global Health, Vanderbilt University School of Medicine, Nashville, Tennessee, when this article was written

Yujiang Jia, MD, DrPH,

Research assistant professor, Pediatrics, and director, Vanderbilt–China HIV Program, Vanderbilt University School of Medicine, Nashville, Tennessee

Carol Etherington, MSN, RN, and

Assistant professor, Nursing, Vanderbilt University School of Nursing, Nashville, Tennessee, and was previously president, USA Board of Doctors Without Borders

Alfredo Vergara, MPH, PhD

Deputy director, Institute for Global Health, assistant professor, Preventive Medicine, and director, Vanderbilt–Mozambique HIV/AIDS Program, Vanderbilt University School of Medicine, Nashville, Tennessee

Abstract

The Institute for Global Health at Vanderbilt enables the expansion and coordination of global health research, service, and training, reflecting the university's commitment to improve health services and outcomes in resource-limited settings. Global health encompasses both prevention via public health and treatment via medical care, all nested within a broader community-development context. This has fostered university-wide collaborations to address education, business/economics, engineering, nursing, and language training, among others. The institute is a natural facilitator for team building and has been especially helpful in organizing institutional responses to global health solicitations from the National Institutes of Health (NIH), Centers for Disease Control (CDC), and other funding agencies. This center-without-walls philosophy nurtures noncompetitive partnerships among and within departments and schools. With extramural support from the NIH and from endowment and developmental investments from the school of medicine, the institute funds new pilot projects to nurture global educational and research exchanges related to health and development. Vanderbilt's newest programs are a CDC-supported HIV/AIDS service initiative in Africa and an overseas research training program for health science graduate students and clinical fellows. New opportunities are available for Vanderbilt students, staff, and faculty to work abroad in partnership with international health projects through a number of Tennessee institutions now networked with the institute. A center-without-walls may be a model for institutions contemplating strategic

investments to better organize service and teaching opportunities abroad, and to achieve greater successes in leveraging extramural support for overseas and domestic work focused on tropical medicine and global health.

The Vanderbilt University School of Medicine Institute for Global Health (VIGH) is based in Nashville, Tennessee, with projects and partnerships in more than two dozen nations as of 2007.* More than half of the core faculty and staff of the VIGH live full-time in one of the three nations where the largest extramurally funded work of the VIGH is supported: Mozambique, India, and China. The VIGH is a relatively new entity, having been established in July 2005 with the creation of a chair in global health named for a former chairman of pediatrics, Dr. Amos Christie, that was endowed by Nashville's Stahlman family.¹ In October 2006, a limited liability corporation affiliated with Vanderbilt Health, Friends in Global Health, LLC (FIGH), was established to enable Vanderbilt to partner effectively in developing countries where subcontracting arrangements with in-country institutions are not yet practical to achieve key development and training goals. In May 2007, FIGH was registered as a nongovernmental organization (NGO) in Mozambique, where it facilitates local logistics and personnel management.

Both the VIGH and FIGH promote interdisciplinary education, research, and service partnerships to address health issues that transcend national boundaries. Our goals are compatible with the medical center's overall philosophy based on a creative variation of the classic academic triad of teaching, research, and service (see Figure 1). Dozens of faculty and students in the Vanderbilt academic community travel to developing countries each year, often nested within a teaching context. The VIGH does its best to help link student, staff, and faculty interests with overseas opportunities. The director (S.H.V.) and deputy director (A.V.) of the VIGH meet with more than 200 persons yearly from the greater Nashville community, some of them repeatedly, in the service of facilitating their research, service, or teaching work abroad.

We at the VIGH view health programs within their social, economic, and developmental contexts; it is this viewpoint that drives our broader mission. In Mozambique, the VIGH has begun a health care project partnership (described later) with the ministry of health. This work is being expanded to include prevention and local economic development, including activities in agriculture, education, gender empowerment, water and sanitation, nutrition, transportation, communications, and microloans for small-business development (insofar as we succeed in raising needed funds). All projects must be named by local stakeholders as priorities and must be developed through community consultation and mobilization. This broader agenda is vital for the sustenance and expansion of any early health gains.

The Mission and Objectives of the VIGH

The mission of the VIGH is to foster interdisciplinary research, teaching, and service activities linked to health and development in resource-limited settings of the developing world.² Other parts of the university have vibrant collaborations with more prosperous nations such as those in Western Europe, Australia, or Japan; these are not the focus of the VIGH except when these partnerships in turn create triangle partnerships with developing countries. An example of this exception is Vanderbilt's engagement with the United States–Japan Cooperative Sciences Program and its focus on encouraging developing nations in Southeast Asia into research and

* *Americas and the Caribbean*: Mexico, Costa Rica, Guatemala, Haiti, Honduras, Jamaica, Argentina, Bolivia, Brazil, Chile, Colombia, Peru.

Africa: Angola, Gambia, Ghana, Kenya, Liberia, Mali, Mozambique, Nigeria, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zambia.

Asia: Bangladesh, China, India, Jordan, Pakistan, Thailand, Vietnam.

training partnerships with Japanese and American institutions. Our emphasis on developing country health partnerships reflects a unique niche within our institution.

Our approach is to strengthen and sustain the activities and interests of the Vanderbilt community that are within our mission by

- facilitation of international contacts for program development and training;
- advocacy for better equity in global health investments;
- assistance in securing resources for a broad range of international activities;
- standardization and facilitation of overseas administrative, clinical, and scientific approaches to global health;
- improvement of communication through internationally targeted Web-based programs, on-campus seminars and symposia, and support of information systems, including telecommunications, distance learning and supervision, and Internet connectivity at all field sites, no matter how remotely located in rural settings;
- nurturance of partnerships with institutions in the United States and abroad that share the goals of the VIGH and wish to collaborate with Vanderbilt faculty, staff, and/or students; and
- establishment of an especially close working relationship with nearby Meharry Medical College that has synergistic traditions of overseas partnerships, especially in Africa.

By facilitating overseas and domestic partnerships aimed at addressing problems in resource-limited settings, we at the VIGH see clear evidence that Vanderbilt itself is enriched through diversity in its student body and visitors, and in the sensitivity to the global challenges in health and development evidenced by student-led activities. For example, two brothers, both Vanderbilt medical students from western Kenya, have built a medical clinic in their home village of Lwala³ that began as a medical student summer project and culminated with broad assistance from both the Vanderbilt and Dartmouth University and alumni communities. By serving as a facilitating body for expanding the activities of individual scientists and departments across the Vanderbilt campus, the VIGH aids multidisciplinary research, teaching, and service efforts to combat health conditions that result from poverty, social and economic vulnerability, tropical entomological threats, and disparities in access to health care and prevention.

VIGH Partnerships

The VIGH is hosted within the dean's office in the school of medicine, but it is managed as a regional resource. Multiple schools and programs within Vanderbilt and colleges/universities in middle Tennessee are current collaborative partners, as is the state health department (for training) and the state governor's office through the state department for economic and community development (for a special rural health project in China). Through the Meharry–Vanderbilt Alliance,⁴ we at the VIGH have a close working relationship with the Meharry Medical College in Nashville, including partnerships in the Vanderbilt–Meharry Framework Program in Global Health, sponsored by the Fogarty International Center (FIC)–National Institutes of Health (NIH), and several other programs described here.⁵ In partnership with the Association of American Medical Colleges,⁶ Vanderbilt manages the FIC Research Scholars⁷ program for the NIH that provides mentored research training experience in developing countries to health science graduate students. In October 2007, we launched a new Fogarty International Clinical Research Fellows program to provide an overseas mentored research year for persons in postdoctoral clinical or research fellowships, thus complementing

the student-focused program. Likewise, in partnership with the University of Alabama at Birmingham (UAB) School of Public Health, and with its Centre for Infectious Disease Research in Zambia (CIDRZ), Vanderbilt conducts training through the Vanderbilt–UAB AIDS International Training and Research Program (AITRP) supported by the FIC–NIH. We have a special Zambia supplement for in-country research training from the President's Emergency Plan for AIDS Relief (PEPFAR) through the Centers for Disease Control and Prevention (CDC) Global AIDS Program (CDC-GAP) Zambia office. The CDC support enhances the core NIH AITRP program by supporting advanced, in-country training in research, working with AITRP graduates who have returned home to Zambia after their education, University of Zambia School of Medicine MMed degree candidates, and other Zambian program investigators who might benefit from continuing education in grant and manuscript preparation training. The VIGH works closely with Family Health International in HIV prevention clinical trials through the NIH-supported HIV Prevention Trials Network (HPTN).⁸ The VIGH has a new partnership with Westat, Inc., for program monitoring and evaluation in our PEPFAR work in Africa. The VIGH has its overseas health program partners (as of 2007) in Africa, Asia, South America, and the Caribbean (see Table 1).

Funding for the VIGH

There are two major funding streams that support the work of the VIGH. One is the extramural grant support for research, training, or overseas clinical service from the U.S. Public Health Service through the NIH and the CDC, which are detailed below. The second is from institutional investments made by Vanderbilt itself. These include developmental funds from the vice-chancellor for health sciences and the dean of the school of medicine for the VIGH, enhanced by support for a separate complementary entity, the Vanderbilt International Office,⁹ from the provost and chancellor. Two endowments are most helpful for sustained support: a student travel and research fellowship endowed by the Overall family, and the endowment from the Stahlman family for the Amos Christie Chair in Global Health. New support from the chancellor and provost has been provided for peer partnerships overseas (the first three are with the University of Cape Town,¹⁰ the Universidade de São Paulo,¹¹ and the University of Melbourne¹²) through the Vanderbilt International Office. Three student programs are described below (Emphasis Program, Medical Scholars Program, and Master of Public Health [MPH]/Master of Science in Clinical Investigation [MSCI] degree programs). Foundation and charitable support represent about 1% of the VIGH and FIGH estimated \$10 million core budget as of 2007, with approximately 6% supported from operating and development funds from the dean's office, and about 93% from extramural grant funds. Extramural funds that come through principal investigators who are not among the seven “core faculty” of the VIGH are not included.

Major Programmatic Theme Areas

Vanderbilt faculty members are active in global health activities in more than 30 countries, as noted earlier. Since its founding in 2005, the VIGH has maintained as a principal goal to unearth and catalogue the substantial array of preexisting research of global health relevance at the university. A second immediate goal has been to secure extramural support for the work of faculty and trainees with primary interests in global health topics. In this article, because of space constraints, we cannot cite all global health research extant at Vanderbilt, including fascinating projects in the history of Chinese traditional medicine,¹³ substance abuse treatment results in Vietnam,^{14,15} and microcredit loans in health development.¹⁶ Nor do we have space to review all the medical and nursing school service work, including partnerships with universities, clinics, and medical mission organizations, as well as individual faculty affiliations with faith-based medical mission organizations and independent NGOs, such as Médecins Sans Frontières/Doctors Without Borders.¹⁷ A 2007 project of the VIGH is the

development of a database to track overseas endeavors. These will include projects that derive from Vanderbilt itself (e.g., the Lwala Project¹⁸ and the Vanderbilt Children's Hospital¹⁹) or that are led from other middle Tennessee organizations (e.g., the Visitation Hospital, a new Haitian clinic initiative,²⁰ and the International Leadership Development Institute²¹).

Principal Programs

The sections below describe the principal programs in the major theme areas of service, research, and research training undertaken by faculty at the VIGH.

Infectious diseases research

HIV/AIDS clinical care and service initiative—Mozambique—The VIGH supports seven government primary care clinics in Zambézia Province of Mozambique, through the FIGH, which is licensed as an NGO in Mozambique (led by A.V. and S.H.V.). We began our work in 2006 through a subcontract from the Elizabeth Glaser Pediatrics AIDS Foundation as part of funding from CDC-GAP under PEPFAR, and we competed successfully for independent funding in 2007. Zambézia has more than four million inhabitants (one of the two most populous provinces) in an area the size of Tennessee. With only one city with more than 100,000 persons, the population is scattered in rural and small town areas, with an economy based on subsistence agriculture. The 20% adult prevalence of HIV has resulted in a skyrocketing death rate. Vital statistics are poor, but demographers estimate that life expectancy is now below 45 years, considerably worse than in the pre-HIV era. In addition to rural logistics, Mozambique's severe health manpower shortages place that nation near the bottom in doctor-to-patient and nurse-to-patient ratios in the world.²² Zambézia Province typically has only one medical doctor per district (the population in each district ranging from 120,000 to 250,000), with the exception of the provincial capital, and the number of allied health workers in general is very limited. Because it is a very rural and impoverished area, antiretroviral therapy (ART) roll-out has been slower than in urban areas of Mozambique, with only 4% of those needing treatment currently enrolled in ART programs. As of 2007, the VIGH/FIGH supports HIV care and treatment programs in four districts: Ilé, Alto Molòcué, Namacurra, and Inhassunge, with plans to expand to three more by early 2008. The VIGH/FIGH is one of two principal implementing partners for care and treatment as of 2007 (along with Columbia University, led by Dr. Wafaa El-Sadr²³). The program provides training and quality-related assistance in care and treatment, psychological support, community outreach, pediatric ARV treatment, laboratory development, infrastructure improvement, drug delivery and pharmacy logistics, and program implementation. FIGH staff and VIGH faculty members serve in principal roles as technical assistants, trainers, facilitators of operations (clinical, monitoring and evaluation, pharmacy, and laboratory), quality assurance/quality control, and procurement and logistics partners. In the first quarter of 2007, the clinics supported by the FIGH enrolled 1,779 HIV-positive patients for care (1,066 women), of whom 231 (128 women) received ART (A.V., unpublished data). We are experiencing very rapid growth in the numbers of persons coming in for care and treatment, now that the community has become aware of the program.

HIV prevention clinical trials—multiple countries in Africa, Asia, Latin America—The HPTN is a collaborative clinical trials network⁸ funded by NIH through the National Institute of Allergy and Infectious Diseases (NIAID). The HPTN develops and tests the safety and efficacy of interventions designed to prevent the transmission of HIV, focused on approaches that can provide a more immediate impact than likely with the longer-term investments into microbicides and vaccines (nurtured by separate networks). The VIGH serves as the coordinating and operations center for the HPTN in partnership with Family Health

International and coordinates with NIH-funded clinical trial units in Brazil, Peru, the United States, China, India, Thailand, Malawi, South Africa, Tanzania, Zambia, and Zimbabwe.

HPTN clinical trials at sites in these countries usually study HIV seroconversion end points in randomized trials, with assistance from three linked central resources: a coordinating and operations center, a statistical and data management center, and a network laboratory. Together, these central resources are responsible for the scientific management of the HPTN through an executive committee that includes topic experts, community representatives, clinical research site investigators, and NIH representatives. HPTN nurtures concept and protocol development, study implementation, and dissemination of results. Four trials are now in progress worldwide: (1) use of antiretroviral therapy to reduce transmission (HPTN 052), (2) suppression of human herpesvirus type 2 to reduce HIV acquisition (HPTN 039), (3) community-level advocacy for voluntary counseling and testing for HIV (HPTN 043), and (4) use of buprenorphine/naloxone to reduce HIV acquisition in injection drug users with opiate dependence (HPTN 058).

Estimation models for HIV/AIDS—China—China's population of 1.3 billion is facing an expanding HIV epidemic. Cultural, ethnic, geographic, and sociodemographic diversity make it challenging to develop accurate information on the successes or failures of disease prevention programs. There is a need to improve the estimates of HIV prevalence and to provide accurate subgroup data. The specific aims of this project are (1) to evaluate critically the quality and the generalizability of data from different sources in selected provinces, (2) to assess the validity of the new estimation and projection package of UNAIDS/WHO in estimating short-term projections of selected provinces, (3) to improve estimates of the true prevalence of the HIV/AIDS epidemic in selected provinces, using seroprevalence, surveillance, and modeled data, and (4) to assess the epidemic growth rate in the provinces studied and guide the China CDC²⁴ as to where interventions are most urgently needed. We (led by Y.J.) are in the process of estimating prevalence in three provinces with varying risk exposures: Fujian (sexual transmission), Yunnan (injection drug use and sexual transmission), and Xinjiang (injection drug use and sexual transmission), to establish better ongoing modeling estimates for HIV/AIDS in China.

Measuring incident HIV-1 infections—China—Although tracking HIV prevalence provides a picture of the history of the epidemic, it does not highlight recent trends (“hotspots”) of special importance in China's “concentrated” epidemic. Measuring HIV incidence is needed to distinguish between recent and long-term HIV infection, to facilitate time-sensitive evaluation of HIV-transmission dynamics, to pinpoint outbreaks, and to measure the effectiveness of prevention programs. Chinese health authorities have no effective measures for HIV incidence. The objective of our study (funded mid-2007 and led by Y.J.) is to validate a serologic method—an immunoglobulin-G-capture types B, E, and D (BED)-enzyme immunoassay (BED-CEIA) to identify recent HIV-1 seroconversion—to measure HIV incidence in China from cross-sectional survey data.

Pediatric, adolescent, and vaccine-related HIV research—Haiti—VIGH faculty members partner in three key elements of a major Haiti program: (1) pediatric care and treatment, (2) safety and immunogenicity of candidate HIV vaccines, and (3) risk factors for HIV infection among Haitian adolescents and youth (ages 15–24 years) who come for voluntary counseling and testing. These studies at the GHESKIO clinic,²⁵ an NGO, in Port-au-Prince, represent a 20-year partnership of Dr. Peter Wright and other Vanderbilt faculty with Cornell University and the GHESKIO team. The GHESKIO team in Haiti has been able to demonstrate excellent clinical outcomes among infants and children needing antiretroviral therapy supported by the VIGH.²⁶ Some of the first HIV vaccine trials conducted outside of the United States or Western Europe were conducted in Haiti, with good clinical and good laboratory practice standards.²⁷

International epidemiological databases—Caribbean, Central America, South America—The Caribbean, Central America, and South American Network for AIDS Research²⁸ (CCASAnet, led by primary investigator Dr. Dan Masys) is one of seven NIH/NIAID-supported networks for clinical and epidemiological data sharing and research. Vanderbilt serves as the data coordinating center for a seven-nation program based in HIV/AIDS clinics in Argentina, Brazil, Chile, Haiti, Honduras, Mexico, and Peru.²⁹ The site investigators represent some of the region's most renowned HIV researchers. The CCASAnet is one of the family of International Epidemiologic Databases to Evaluate AIDS grants made in 2006 to enable regions to compare and contrast data and clinical experiences to learn about HIV care and treatment outcomes of varying strategies and drug combinations throughout the world.³⁰

Tuberculosis research—Brazil, Mozambique—Much of Vanderbilt's international clinical tuberculosis (TB)-related research (led by Dr. Tim Sterling) has been focused in Brazil through the Universidade Federal do Rio de Janeiro (UFRJ)³¹ and has focused on risk factors for invasive (miliary/meningeal) TB in young children, as well as in TB–HIV interactions. This immunogenetics-related research seeks to identify children at greatest risk of this severe manifestation of TB and to provide insights into the mechanism of protection of the current TB vaccine (BCG), as well as ways to improve the protection provided by BCG. There is also a partnership with the Instituto Oswaldo Cruz in Rio de Janeiro in their similar studies among adults. The UFRJ site is also part of the CDC-funded multicenter Tuberculosis Trials Consortium, which, with Vanderbilt faculty protocol chair leadership, is recruiting patients for a large clinical trial focusing on effectiveness and tolerability of an improved drug regimen for latent TB infection. Vanderbilt collaborates with the Brazilian team at UFRJ on two Fogarty initiatives, including the 2005 funded Framework planning grant at UFRJ, and laboratory training in TB immunogenetics for students and young investigators from UFRJ and Vanderbilt in both labs. TB work in Mozambique has also begun in the context of our VIGH-led PEPFAR project.

Malaria research and training—Tanzania, Gambia, Mali—The Gates Grand Challenge Grants Program of the Bill and Melinda Gates Foundation supports a Vanderbilt-coordinated global consortium led by Dr. Laurence J. Zwiebel³² to characterize specific genes and gene products that control olfactory sensing in malaria mosquito vectors. This includes study of the blood-meal source (host) seeking and selection in the mosquito *Anopheles gambiae*, the highly efficient vector for malaria in West Africa. Molecular events of olfaction may predict the overall host preference behaviors in mosquitoes and other insect disease vectors. This aspect of the mosquito's behavior is especially important because it makes a significant contribution to the vectorial capacity of this arthropod vector, as well as playing a similar role in the overall impact of many other insects of economic importance. Vanderbilt's partner institution in Tanzania is the Ifakara Health Research and Development Centre,³³ and its partner institution in Gambia is the Medical Research Council Laboratory,³⁴ both of which are well known internationally for their basic and clinical science research on malaria. In allied efforts, Vanderbilt faculty members study biomineralization that plays a key role in malaria pathophysiology and predictors of sporozoite invasion of mosquito salivary glands (Dr. Juliàn Hillyer). The VIGH has served as a training site for the UAB International Centers for Excellence in Research training initiative for Mali (led by Dr. Eric Chamot at UAB), focused on vaccine trial training for a now-extant malaria study.

Research on emerging infectious diseases—China, the United States—Vanderbilt is one of the six principal southeastern universities in the Southeast Regional Center of Excellence for Emerging Infections and Biodefense (SERCEB)³⁵ consortium to study microbes that could be used in a bioterrorist attack. In addition, numerous other regional

institutions participate in scientific and training programs of the SERCEB, including Meharry. A Vanderbilt faculty member, Dr. Mark Denison, serves as coprimary investigator and steering committee member and conducts research in human coronaviruses.³⁶ SARS provided an example of how a decade of basic research at Vanderbilt served as the springboard for rapid further progress as coronavirus biology became of crucial global importance. The SERCEB centers work to develop the next generation of vaccines, drugs, and diagnostic tests for defense against organisms that could be used in bioterrorist attacks, as well as against emerging infections such as avian influenza. SERCEB supports career development for training new and established scientists in biodefense, placing an emphasis on attracting and training minority scientists, in close coordination with the Meharry–Vanderbilt Alliance.

Women's health and child health research

Cervical cancer screening for HIV-infected women—India, Zambia—This collaboration between the VIGH, the National AIDS Research Institute (NARI, part of the Indian Council for Medical Research)³⁷ in India, the CIDRZ,³⁸ and affiliated medical schools and hospitals, is engaged in conducting clinical and operational research studies and service roll-out programs related to cervical cancer prevention for HIV-infected women in resource-limited settings. This work has documented the increased risk for cervical precancerous lesions and the high prevalence and diversity of oncogenic human papillomavirus (HPV) types among women living with HIV/AIDS.^{39,40} We at the VIGH (led by V.V.S.) are evaluating screening protocols using cost-effective methods like visual inspection with acetic acid and same-visit treatment approaches like cryotherapy. These methods require minimal dependence on infrastructure, can be taught to nonphysician health workers, and minimize loss-to-follow-up by linking screening and treatment in the same clinic visit, thus providing viable alternatives or adjuncts to cytology (Pap smear)-based screening that has failed to make an impact in reducing cervical cancer rates in developing nations. The VIGH's work is also geared towards building site capacity for undertaking HPV vaccine trials and developing partnerships for community-based prevention trials with our partner institutions.

Neonatology research—Colombia—Vanderbilt faculty member Dr. Mario Rojas cofounded the Colombian Neonatal Research Network through collaboration with Universidad Javeriana in Bogota and with early support of the International Clinical Epidemiology Network⁴¹ in Colombia. Dr. Rojas and colleagues conduct epidemiologic studies and clinical trials designed to improve the care of preterm neonates at 10 different hospital centers in three Colombian cities.^{42,43} In one completed trial, a high-frequency oscillator (a new type of ventilator) was studied to see whether it could be a better option than conventional ventilators in the treatment of severe respiratory failure in newborns.⁴⁴

Early childhood diarrhea and malnutrition—Brazil—Spearheaded by pediatric gastroenterology faculty member Dr. Sean Moore, in collaboration with the University of Virginia, this research examines the long-term developmental impact of well-characterized diarrhea and malnutrition in early childhood through a series of field and laboratory studies with Brazilian partners in Fortaleza. Building on more than 20 years of collaborations between Virginia and Fortaleza, Dr. Moore is able to provide added value and move quickly with willing and nurturing senior partners.^{45,46}

Chronic diseases and nutrition research

Chronic disease research in cancer, nutrition, and cardiovascular diseases—China—Vanderbilt's largest international project predates the two-year existence of the VIGH. Through the department of medicine, the center for health service research, the epidemiology center, and the institute for public health and medicine, Vanderbilt faculty have been active for more than a decade in cancer epidemiology collaborations with the Shanghai

Cancer Institute. The Shanghai Women's Health Study (SWHS) was initiated in 1996 and has recruited more than 75,000 Chinese women in Shanghai for long-term epidemiologic studies of cancer and other chronic diseases and to collect biologic samples to evaluate biomarkers.⁴⁷ Ongoing research includes four NIH/National Cancer Institute/National Heart, Lung, and Blood Institute R01-supported projects on cancer, coronary heart disease, stroke, asthma, diabetes, hypertension, bone fracture, and obesity. Current work in molecular epidemiological research on breast cancer in China investigates genes associated with estrogen metabolism, pathways of angiogenesis, extracellular matrix remodeling, inflammatory response, and prostaglandin synthesis. This two-phase study design will enhance our understanding of the etiology of breast cancer and will help identify high-risk women for primary and secondary prevention of breast cancer in other settings worldwide. A 73,000-person men's cohort, also in Shanghai, is a long-term epidemiological study of cancer and other chronic diseases, with a focus on identifying modifiable dietary factors for cancer. This study is highly cost-efficient because most of subjects have already been recruited for study through the SWHS. Follow-up rates are excellent in both cohorts. Opportunities exist to study such topics as soy foods, gene polymorphisms, and endometrial cancer risk, and a similar study is in progress of soy foods related to coronary heart disease. Led by Drs. Wei Zheng and Xiao-ou Shu, the new Vanderbilt Epidemiology Center has grown out of successes in this program.

Breast cancer research—Nigeria, Kenya, Ghana—Pilot studies are underway in Nigeria and Ghana under the aegis of the Vanderbilt–Meharry partnership through the Vanderbilt Ingram Cancer Center, which is led by faculty at Meharry Medical College collaborating with the Obafemi Awolowo University in Ile-Ife, Nigeria, and the University of Nairobi, Kenya. The study (led by primary investigator Dr. Flora Ukoli) has planned biological samples, medical histories, and food frequency questionnaires from 78 Nigerian participants. Study investigators are in the process of identifying additional suitable sites in Nigeria, Kenya, and Ghana, to increase the rate and diversity of the study population.

Cardiovascular disease/population genetics research—Ghana—Vanderbilt faculty member Dr. Scott M. Williams studies human population genetics and the differential distribution of disease-causing genes across populations.⁴⁸ This research focuses on classes of diseases that are more common in people of sub-Saharan African descent, namely, fibroproliferative diseases (hypertension and keloids) in Africans and African Americans. Genetic studies of these conditions are used as a model for understanding the differential distribution of genetic diseases in general. The hypertension research focuses on a population from Ghana that served as one of the major source populations for the African American genome. Using association/linkage disequilibrium analyses of several candidate genes, including the renin–angiotensin–aldosterone system, the Vanderbilt lab is dissecting the genetic basis of this disease in collaboration with an international team of colleagues. The partnership has spawned the founding of the African Society of Human Genetics.⁴⁹ Based in Accra, Ghana, the society's membership is pancontinental, with vibrant annual meetings held in Africa.

Programs for research training

AIDS research training—Zambia, China, Pakistan, India, Russia, Bangladesh—The Vanderbilt–UAB AIDS International Research Training Program (AITRP)⁵⁰ partners with international collaborators from six countries; principal nations are Zambia, China, and Pakistan, with developmental activities in India, Mozambique, and Bangladesh. The AITRP trains foreign scientists and key research support staff to conduct independent research and training in their home countries and to perform at an internationally competitive level in collaborations with both local and foreign scientists. As of 2007, its ninth year of funding from the FIC, the AITRP has trained 52 persons in MPH, master of science in public health (MSPH),

or DrPH degrees—nearly all of whom have returned to their home nations—and more than 1,200 persons in short courses conducted in home nations or in the United States. Our recent innovation has been to conduct in-country training in Zambia for trainees from the program as well as those trained by others to give “midcareer” updates in study planning, research skills, and grant/manuscript writing.

Global health curricular development at Vanderbilt and Meharry—The Fogarty Framework program⁵¹ supports innovation and enhancement of global health training programs and partnerships both at U.S. and overseas academic institutions. The Vanderbilt–Meharry Framework Program in Global Health facilitates interdisciplinary faculty and student research in global health, and it coordinates key Vanderbilt–Meharry activities designed to share knowledge and foster local and global networking. The program supports the development of a “public health literacy” course for undergraduates and a “global health foundations” course for graduate students, both of which will be launched in 2008. The latter will be the first-ever jointly taught course by the Vanderbilt MPH and the Meharry MSPH programs. An 18-semester-hour global health certificate program will be managed by the VIGH and in place by 2009. Five overseas partner institutions for this Framework program represent longstanding academic research relationships with Vanderbilt and Meharry, namely, universities in Rio de Janeiro, Brazil³¹; Lima, Peru⁵²; Shanghai, China⁵³; Lusaka, Zambia⁵⁴; and Puebla, Mexico.⁵⁵ Dr. Maria Fatima Lima coordinates the Meharry components with two VIGH faculty (S.H.V. and V.V.S.).

Ethics in research training—Costa Rica—A multiinstitutional collaboration to expand ethics and institutional review board training in Costa Rica⁵⁶ is spearheaded by Dr. Elizabeth Heitman in a partnership built from years of interaction. The joint expectation is that excellence in teaching and conduct of research ethics and review will create a Central American hub of excellence that can serve neighboring nations' academic and government institutions. In this way, training excellence is extended far beyond the Fogarty training institutions themselves.

International emergency medicine—Zambia, India, Peru, Guyana—Vanderbilt's department of emergency medicine has an active international medicine program. Four or more faculty members travel annually to countries with limited medical technologies and practices to assist local care providers in upgrading their emergency medical programs. In a rural Zambian program conducted through overseas Baptist church contributions, for example, more than 10,000 persons are screened and treated yearly in a rural mobile medical program. In 2006, a pilot HIV rapid testing program was successfully in identifying persons for referral to newly available PEPFAR-supported services in a nearby town. Faculty ties to Zambia, India, Peru, and Guyana are sustained, permitting repeat visits and more sustained service and training contributions. In turn, Vanderbilt faculty and students learn a tremendous amount about tropical medicine and cultural competencies.

Global health research, service, and training outside of the medical school

The medical school is by no means the only repository of work in global health. The VIGH seeks to network all university and regional initiatives to improve communication and coordination, as well as to improve the funding competitiveness of all global health activities. A few of these initiatives are discussed below.

School of nursing—mass casualty education—The Vanderbilt University School of Nursing (VUSN) has formal agreements with the following international hospitals and universities: Bournemouth, United Kingdom; Upsalla University, Sweden; Pohojivous, Finland; Scheer Hospital, Nepal; Free University School of Medicine, Belgium; and University of Central Piedmont School of Medicine, Italy. The development of expertise at VUSN in

disaster planning, systems management, and online education will contribute to establishing it as a core for a Pan American Health Organization (PAHO) Collaborating Center for Mass Casualty Education.

Three primary focus areas include cost-effective health care interventions, training health care staff, and e-health issues (i.e., Web-based education and data sharing). Tennessee-based programs such as the Vine Hill clinic's digital retinopathy screenings that encourage low-income patients to get free screenings as a way to check eye and overall vascular health (especially for diabetes) are highly suitable for overseas implementation. PAHO sees overseas relevance for the school of nursing's successful distance learning program and our work in examining the ongoing nursing shortage—a crucial issue for developing nations.^{57–59} Numerous faculty have international experience, and one (C.E.) has been engaged for more than two decades in refugee health in times of war or civil strife.

Health development and education—Latin America, Eastern Europe, Middle East—Faculty led by Dr. Stephen P. Heyneman, of the department of human and organizational development in Vanderbilt's Peabody School of Education, work with the World Bank, United Nations High Commissioner for Refugees, other multilateral development agencies, the private sector (Harza Engineering Company International), and academic research institutions in fostering international community development at the policy, design, and project implementation levels. Related work abroad includes study of the contribution of education to social cohesion, education and corruption, trade issues associated with education commerce, comparisons in reform of higher education finance and management, issues of examinations and standardized testing, policy shifts in vocational and technical education, education financing and educational quality, economic choices of educational technologies, and cognitive skills and economic development. In recent years, other members of the education faculty have worked on the promotion of value-based practice and interventions in community mental health overseas.⁶⁰

Medical anthropology, sociology, ethnomusicology—Brazil, Guatemala, Peru, Kenya, Uganda, Tanzania—A Vanderbilt medical anthropologist (Dr. Beth A. Conklin) has conducted ethnographic field work since 1985 among the Wari (Pakaas Novas), a group of about 2,000 native people who live in the rainforest of western Brazil. Five major issues have been addressed: (1) historical and contemporary patterns of health, disease, and nutrition, (2) ethnomedicine, (3) cultural responses to grief and mourning, including cannibalism, (4) the politics of indigenous activism and government policy, and (5) reproductive health services.⁶¹ A Blair School of Music faculty member (Dr. Gregory F. Barz) conducts medical ethnomusicology research in Uganda, Kenya, and Tanzania. Within this emerging discipline, the role of music and culture in adolescent-coming-of-age rituals in Africa, especially male circumcision, is set within its anthropological context.^{62–64} Vanderbilt's Cancuen Archaeological and Community Development projects focus on Mesoamerica and South America to learn of the origins, declines, and “collapses” of civilization, including health-related origins, ethnic ideologies, and indigenous rights and development (Dr. Tiffany A. Tung).⁶⁵ Investigators in Peru study migration, the long-term transformative processes leading to political and economic change, and the interdisciplinary and historical methodologies designed to study those processes, with a special interest in long-term human and environmental interaction on the north coast of Peru.

The VIGH's Educational Mission

A variety of programs offered at Vanderbilt nurture our students' burgeoning interests in global health.

The Medical Student Emphasis Program

The Medical Student Emphasis Program provides medical students with the opportunity to acquire specialized knowledge and experience by working in one of nine focus areas, including global health. This in-depth experience helps prepare students with laboratory, clinical, and/or field epidemiology research skills. Of the approximately 315 medical students from 2005 to 2007, 23 (7%) have gone abroad for their research summer. Examples of projects include HIV/syphilis among indigenous peoples of the Amazon, WHO/UNICEF polio-eradication efforts in northern India, HIV treatment adherence in rural Zambia, and trauma surgery in Nigeria, among 19 other projects.^{66,67} Some students have been mentored by experienced former medical missionaries on Vanderbilt's faculty who have worked in Nigeria, Kenya, and elsewhere for an aggregate of 62 years abroad, including John Tarpley, MD (surgery), Margaret Tarpley, MLS (surgery), Andy Norman, MD (obstetrics–gynecology), Judy Norman, RN (infectious diseases), and Mark Newton, MD (anesthesiology).

The Medical Scholars Program

The Medical Scholars Program is a one-year in-depth research experience available to Vanderbilt medical students, typically after completion of their second or third year of the four-year program. The goal is to offer an appropriate research environment to students who are interested in biomedical research, clinical, basic, health services, public health, or outcomes research. By permitting a full “fifth”-year experience, students are allowed access to a mentoring group of peers and scientists who share common research interests, with stipend support. This program also permits Vanderbilt medical students to spend their year abroad; in 2006, students worked on HIV monitoring and evaluation in Mozambique and on primary care development and evaluation in Angola. In 2007, students are working on tuberculosis and HIV in Mozambique and on cervical cancer prevention in Thailand.

The MSCI Program

This degree program was developed to train investigators in the techniques and processes used in patient-oriented research. The program is intended to provide direct, mentored experience in clinical investigation and, through didactic work, to provide trainees with a strong foundation in study design, biostatistics, biomedical ethics, clinical pharmacology, human genetics, and assay methods. Students interested in clinical trials overseas have taken this course of study, sponsored jointly by Vanderbilt and Meharry.

The MPH Program

The MPH program at Vanderbilt School of Medicine was developed as a two-year program for physicians and other doctoral-level health care professionals, with the primary objective of providing training for clinical and patient-oriented researchers who will conduct nonexperimental studies or clinical trials with large sample sizes. The MPH program includes didactic course work, a public health practicum, and mentored research, the latter resulting in a thesis. Normally, the applicants are clinical research fellows or faculty who seek training for a future career in epidemiologic, clinical, or health services research or health administration. However, the program also enrolls American students interested in global health research and Fogarty-sponsored overseas students, one of whom is currently doing his thesis on tuberculosis control in Pakistani prisons.

The Medical Scientist Training Program

The Medical Scientist Training Program (MSTP) is designed to foster the development of independent scientific careers by providing a strong core education in medicine and intensive training in scientific inquiry. Successful completion of the MSTP leads to a dual MD/PhD degree. Global health themes have been pursued by a number of students, particularly in the

department of microbiology and immunology. The program, begun in 1977, enrolls an average of 10 new students yearly, each of whom receives a tuition scholarship and a stipend to cover living expenses.

The Vanderbilt Field School

The program is taught yearly by Peabody School of Education faculty in a two-semester sequence that enables students to carry out community research and action overseas. In 2003 and 2004, graduate students worked in the Chimborazo and Esmeraldas provinces of Ecuador among Quichua and African Ecuadorian peoples. The work centered on the impact of programs aimed at building human and social capital in indigenous, minority communities, through grants provided to young people to finish high school, university, or postgraduate studies. In 2006, the field school was conducted in Argentina, and the 2007 field school is health-focused in the Guangxi Autonomous Region of southern China. Graduate students learn the methods and techniques of field research as well as much that cannot be taught in classrooms but can only be learned through experience in another culture. Coming out of the successes of the field schools, a new 2006 curricular innovation, the International Leadership and Development track for Human and Organizational Development majors, is an effort to broaden students' horizons toward careers at home and abroad in development, and to direct graduate research projects with intercultural and international themes.

The Gorgas Course in Clinical Tropical Medicine

This course is cotaught each year with active participation by Vanderbilt faculty (S.H.V.) at the Instituto de Medicina Tropical “Alexander von Humboldt” at the Universidad Peruana Cayetano Heredia.⁶⁸ The nine-week course is led by Peruvian and UAB codirectors Drs. Eduardo Gotuzzo and David O. Freedman and is a highly successful “south-to-north” example of training.

Special Challenges and Opportunities of Work in Global Health

Funding for the VIGH is very competitive and always a challenge to maintain. The authors estimate that Vanderbilt faculty write more than 100 grants per year with global health content. Overseas teaching programs are more costly than those based in the United States, adding fiscal burdens to students and to the institution. The Amos Christie Chair in Global Health and the Overall scholarships are endowed, stable sources of support for global health activities.

The need to write grants to support work is not unique to global health, of course, and there is no better time to expand U.S. university global health opportunities. It is extraordinary what is achievable in program development in the current funding environment. Controlling for inflation, NIH funds have shrunk in the 2002–2007 period under the current administration of President George W. Bush, the first downward trend in recent decades. However, a greater proportion of what is being supported by NIH is directed to globally relevant problems. In contrast to shrinking research funds, the PEPFAR service program⁶⁹ continues to grow to historic levels.⁷⁰ It has been led in large part by academic institutions (e.g., Columbia²³), and Vanderbilt has competed successfully as a “new partner.” The VIGH is launching a new initiative in health management training for rural programs with the foreign loan office of the Chinese Ministry of Health, with the governor's office of the state of Tennessee, through its department of economic and community development, with a broad academic partnership throughout the state that includes East Tennessee State University, the University of Tennessee, and the University of Memphis. Opportunities to expand these activities arise weekly. There is also a new appreciation of global health and research based overseas in the local Nashville audience, as evinced by a special section on global health in a May 2007 issue of *The Tennessean*, Nashville's daily newspaper. Several U.S. academic institutions represented in

this issue of *Academic Medicine* are more experienced in global health education and research than are we at the VIGH. Nonetheless, Vanderbilt has proved to be an institution that can leverage its preexisting academic strengths and that provides strong institutional commitments that can move quickly to build teaching, research, and service in the global health arena. Our progress in building VIGH, beginning just two years ago in 2005, suggests that other institutions may benefit from the center-without-walls approach.

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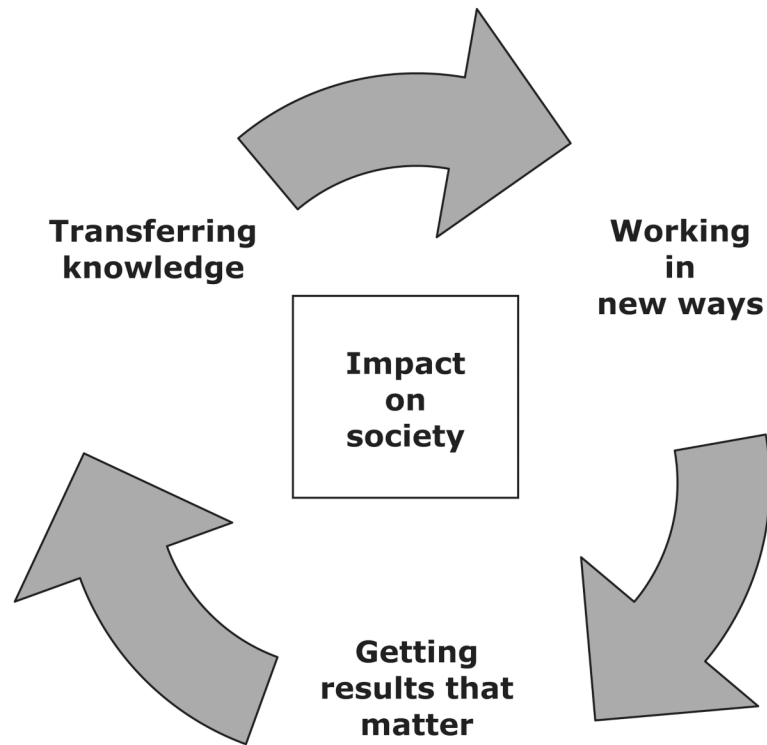


Figure 1.

The Vanderbilt University Medical Center's overall philosophy, based on a variation of the academic triad of teaching, research, and service. The Vanderbilt Institute for Global Health and Friends in Global Health, LLC, embody this philosophy in the global arena by seeking to combine knowledge transfer and innovation in service delivery to provide meaningful results in improving global health in nations around the world. Figure courtesy of Harry Jacobson, MD.

Table 1
Foreign Institutions Working Collaboratively with the Vanderbilt Institute for Global Health in Extramurally Funded Initiatives, as of May 2007*

Nation	Primary institution(s) and Web site	Research	Training	Service
Argentina	The Huesped Foundation, Buenos Aires (http://ccasnet.vanderbilt.edu/members.php#argentina)	X	X	X
Bangladesh	International Centre for Diarrhoeal Disease Research, Dhaka (http://www.icddr.org)		X	
Brazil	Universidade Federal do Rio de Janeiro, Rio de Janeiro (http://ccasnet.vanderbilt.edu/members.php#brazil)	X	X	
Chile	Instituto Oswaldo Cruz, Rio de Janeiro (http://www.ioc.fiocruz.br) University of Chile School of Medicine, Santiago (http://ccasnet.vanderbilt.edu/members.php#chile)	X X	X	
China	Fudan University School of Public Health, Shanghai (http://www.shmu.edu.cn/gwxy/FirstList.html) China CDC (http://www.chinacdc.net.cn) Chinese Ministry of Health (http://www.moh.gov.cn)	X	X	
Colombia	Colombian Neonatal Research Network (CNRN) (http://www.vanderbiltchildrens.com/interior.php?mid=2468)	X	X	
Costa Rica	San Vito Hospital, San Vito (http://www.vanderbiltchildrens.com/interior.php?mid=2469) Nacional de Ninos Hospital, San Jose (http://www.fic.nih.gov/programs/training_grants/bioethics/index.htm)		X X	
Gambia	Medical Research Council Laboratory (http://www.mrc.gm)	X		
Ghana	African Society of Human Genetics, Accra (http://www.afshg.org)	X		
Haiti	The GHESKIO Centers and Cornell University (http://ccasnet.vanderbilt.edu/members.php#haiti) (http://www.vanderbiltchildrens.com/interior.php?mid=2506)	X	X	
Honduras	Hospital de Especialidades IHSS and Hospital Escuela, Tegucigalpa (http://ccasnet.vanderbilt.edu/members.php)	X	X	
India	National AIDS Research Institute, Pune (http://www.nari-icmr.res.in) Tuberculosis Research Center, Chennai (http://www.trc-chennai.org)	X X	X X	X
Jamaica	The University of the West Indies, Mona Campus, Kingston (http://www.soph.uab.edu/sparkman/default.aspx?id=33)		X	
Kenya	Lwala Community Clinic, Lwala (http://www.mc.vanderbilt.edu/root/vumc.php?site=lwala&doc=7079) University of Nairobi, Nairobi (http://www.uonbi.ac.ke)	X		X
Mali	Malaria Research and Training Center (http://obtooure.africa-web.org/index.htm) Project SEREFO, University of Mali, Bamako	X X	X X	
Mexico	Universidad de las Américas, Puebla (http://www.udlap.mx)	X	X	
Mozambique	Friends in Global Health (http://www.mc.vanderbilt.edu/medschool/globalhealth/faculty_staff_mozam.php)		X	X
Nigeria	Obafemi Awolowo University, Ile-Ife (http://www.oauife.edu.ng)	X		
Pakistan	Medical College of Aga Khan University, Karachi (http://www.akdn.org/agency/college_med.html) Dow University of Health Sciences, Karachi (http://www.dmc.edu) BRIDGE (a nongovernmental organization)	X X	X X	
Peru	Universidad Peruana Cayetano Heredia, Lima (http://ccasnet.vanderbilt.edu/members.php#peru)	X	X	X
Russia	School of Public Health, St. Petersburg (http://cira.med.yale.edu/international/aitrp.html)		X	
Tanzania	Ifakara Health Research and Development Centre, Ifakara (http://www.ihrdc.or.tz)	X	X	
Uganda	Makerere University Faculty of Medicine, Kampala (http://med.mak.ac.ug) Rakai Health Sciences Program, Kalisizo	X X	X X	
Zambia	University of Zambia School of Medicine, University Teaching Hospital, Lusaka (http://www.medguide.org.zm/somnew/default.html) UAB-affiliated Centre for Infectious Disease Research in Zambia (CIDRZ), Lusaka (http://www.cidrz.org)		X	

* This list is exclusive of members of the university community who have personal ties and commitments abroad (e.g., faith-based overseas work).